NEW DESIGN OF SCREEN CHAMBER[1]

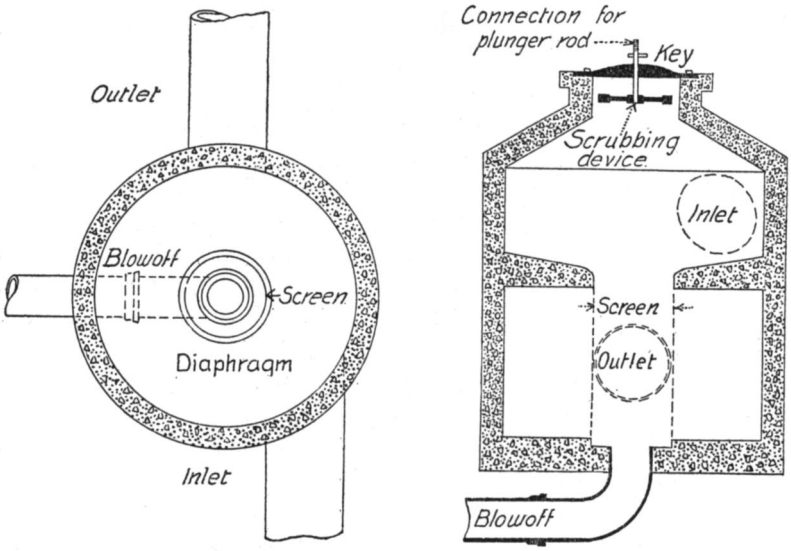
By John H. Lance

In the use of water for supply purposes, its freedom from foreign bodies is of prime importance. While ordinarily the water of driven or dug wells or infiltration galleries is free from detritus, all stream, reservoir and lake supplies require careful screening before the water is admitted to the distribution system. Among the bodies to be removed from the water are grass, leaves, sticks, bits of bark, and fish; and by far the most troublesome of these are leaves in all stream and small reservoir supplies. Masses of water grass only occasionally move to the point of intake; sticks usually only by reason of a high stage of water in the source of supply. Unlike these substances, which do not often of themselves form, by lodging against the screen, a tight barrier to the passage of water, leaves may practically seal the screen and effectually shut off the supply. This result may be caused also, but rarely, by small fish, of such a size as to be unable to resist being carried by the current at the intake. When they have been held against a screen for twenty-four hours, these fish make a tight seal and a very difficult coating to remove; one that is not readily released when the pressure is removed, as are leaves. Only the rarity of conditions favoring such occurrences spares the waterworks operatives a vast amount of trouble. On the other hand, the leaf nuisance, especially in supplies from small reservoirs and streams, makes constant demands upon the attention of the operatives for a considerable part of the year.

The customary method of removing these substances is to install at the intake of the supply main, a screen affixed to the pipe, or two sets of screens in series, which may be drawn up out of the water for cleaning and replaced again for service. The former arrangement which is applicable only to very small depths of water on the screen, is economical in first cost, but its use has not always proved so economical; for owing to any one of many causes the screen might not receive the necessary attention at the very time when it was most needed. The latter arrangement necessitates a consider-

[1]Read before the Richmond Convention, May 9, 1917.

able structure to hold the screens in place and house them while being cleaned. If the reservoir is of great depth the process of cleaning is tedious and expensive, involving, as it does, the hauling up of all the screens in one set and their replacement, for each cleaning. During the time of cleaning the upstream set, the downstream set is receiving leaves and trash. While the cleaning of this set takes place, much of the débris lying against the screen, and any fish between the two sets, go down into the supply main to appear at the various fixtures of consumers or block the operation of meters.



A New Type of Screen Chamber

To obviate these difficulties the pressure screen-chamber here described was designed. It consists essentially, of a vertical cylinder divided by a horizontal diaphragm into two compartments. The upper or inlet compartment communicates with the lower or outlet through a circular opening in the diaphragm and thence through the meshes of an open-ended cylindrical screen resting in the lower compartment, of a diameter nearly that of the opening. The lower end of the screen is concentric with the end of a blow-off pipe with a gate valve on it, normally closed. The inlet pipe enters the inlet compartment tangentially, while the outlet may leave in any direction relative to that of the inlet, preferably in a radial position. Any

flow from the inlet pipe sets up a whirling motion in the water in the upper compartment. In passing through the screen cylinder, it has a circumferential as well as a downward motion, which, owing to the passage of water through the meshes of the screen, diminishes as the bottom of the screen is approached. The result of this is to confine, largely, the foreign matter carried by the water to a central cone the base and height of which are approximately those of the screen. The upturned end of the blow-off pipe being made of nearly as great a diameter as the screen, this results in an accumulation of débris directly in the pipe. When blocking of the screen has progressed to a point at which there is a noticeable loss of head at the screen, as measured preferably by a mercury U-tube or a differential gage, the blow-off gate is opened. The head in the blow-off pipe is then reducted to zero, or nearly so, the hydraulic gradient from the reservoir to the screen chamber is increased, and the high velocity established is transmitted directly to the water passing diagonally downward over the face of the screen and out the blow-off pipe. Ordinarily, the cleaning of the screen is accomplished in about the time that it takes to open and close the blow-off gate. If it is desired to maintain a considerable continuous flow through the outlet pipe, the blow-off gate need not be opened wide, in which case the operation will require a longer time. Under no conditions is an appreciable amount of water wasted.

Also incorporated in the design is a hollow segmental brush, for use in cases when the screen does not have attention for such long periods that a deposit of small fish is not readily removed by the flowing water.

For the intake pipes of pumping stations the devices are best set in batteries of two, so arranged that one can be put in service while the other is being cleaned. In this case the cleaning is preferably done by jets of high-pressure water directed downward from the edge of the diaphragm across the screen. Where electric power is available, the use of proper contact devices at the point of measurement of the loss of head at the screen will make the entire screening operation automatic, both for gravity and pumping supplies.

For use with a gravity water supply, the devices have been found to operate most successfully between the heads of 40 and 60 feet, though there is no valid objection to their use at other heads, under certain conditions. They are made entirely of reinforced concrete with the exception of the manhole cover, which is of cast iron.

The principle of pressure screening, from which the design was developed, was first suggested by O. M. Lance, General Manager of the Spring Brook Water Supply Company. The operation of the screen chambers has been found to be so economical and efficient that they have been adopted as a standard by the above named company. As convenient, all its supply lines, 20 in all, will be equipped with the new device, and the old sliding screens removed, only bar screens being left in place. The new screen chambers have been patented.